

## Shaft Type Ø60mm Single-turn Absolute Rotary Encoder

### ■ Features

- Allows to measure absolute variable angle with BCD code
- Strong against external impact
- Memorizing the absolute position when power is cut off

### ■ Applications

Precision numerical control machine for industrial plant

**⚠ Please read "Safety Considerations" in the instruction manual before using.**



### ■ Ordering Information

<b>ENP</b>	-	<b>1</b>	<b>1</b>	<b>1</b>	<b>R</b>	-	<b>360</b>	-	<b>P</b>
Series	Output code	Output	Power supply	Revolution direction	Pulses/revolution	Control output			
Ø60mm shaft type (shaft diameter : Ø10mm)	BCD code	0: Negative logic 1: Positive logic	0: 5VDC ±5% 1: 12-24VDC ±5%	F: Output value increase at CW direction R: Output value increase at CCW direction	006: 6-division 016:16-division 008: 8-division 024: 24-division 012: 12-division 360: 360-division	P: PNP open collector output N: NPN open collector output			

### ■ Specifications

Item		Shaft Type Ø60mm Single-turn Absolute Rotary Encoder						
Model	PNP open collector output	ENP-111□-006-P	ENP-111□-008-P	ENP-111□-012-P	ENP-111□-016-P	ENP-111□-024-P	ENP-111□-360-P	
	NPN open collector output	ENP-101□-006-N	ENP-101□-008-N	ENP-101□-012-N	ENP-101□-016-N	ENP-101□-024-N	ENP-101□-360-N	
Resolution*1		6-division	8-division	12-division	16-division	24-division	360-division	
Electrical specification	Output phase	TP (timing pulse) : 2-bit TS (signal pulse) : 4-bit (BCD, EP)	TP (timing pulse) : 2-bit TS (signal pulse) : 5-bit (BCD, EP)	TP (timing pulse) : 2-bit TS (signal pulse) : 6-bit (BCD, EP)	TP (timing pulse) : 2-bit TS (signal pulse) : 6-bit (BCD, EP)	TP (timing pulse) : 2-bit TS (signal pulse) : 7-bit (BCD, EP)	TS (signal pulse) : 10-bit (BCD)	
	Output of phase differences	TP1: 53° ±30' TP2: 15° ±30' P: 60° ±30' TS: 56° ±30'	TP1: 39° ±30' TP2: 15° ±30' P: 45° ±30' TS: 42° ±30'	TP1: 3° ±30' TP2: 15° ±30' P: 30° ±30' TS: 26° ±30'	TP1: 2° ±30' TP2: 11 25° ±30' P: 22.5° ±30' TS: 19.5° ±30'	TP1: 8° ±30' TP2: 3° ±30' P: 15° ±30'	TS: 1° ±30'	
	Control output	PNP open collector output NPN open collector output	Output voltage: min. (power supply-1.5V)VDC=, Load current: max. 32mA Load current: max. 32mA, residual voltage: max. 1VDC=					
	Response time (rise/fall)	PNP open collector output NPN open collector output	Ton=800ns, Toff=max. 800ns (cable length: 1m, I sink=32mA) Ton=800ns, Toff=max. 800ns (cable length: 1m, I sink=32mA)					
	Max. response frequency		20kHz					
	Power supply		• 5VDC= ±5% (ripple P-P: max. 5%) • 12-24VDC= ±5% (ripple P-P: max. 5%)					
	Current consumption		Max. 100mA (disconnection of the load)					
	Insulation resistance		Over 100MΩ (at 500VDC megger between all terminals and case)					
	Dielectric strength		750VAC 50/60Hz for 1 minute (between all terminals and case)					
	Connection		Axial cable type					
Mechanical specification	Starting torque	Max. 500gf.cm (0.05N·m)						
	Moment of inertia	Max. 300g·cm <sup>2</sup> (3×10 <sup>-6</sup> kg·m <sup>2</sup> )						
	Shaft loading	Radial: max. 10kgf, Thrust: max. 2.5kgf						
	Mechanical revolution*2	3,600rpm						
Vibration		1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours						
Shock		Approx. max. 75G						
Environment	Ambient temperature	-10 to 70°C, storage: -25 to 85°C						
	Ambient humidity	35 to 85%RH, storage: 35 to 90%RH						
Protection structure		IP50 (IEC standard)						
Cable		Ø8mm, 12-wire, 1m, double shield cable (AWG24, core diameter: 0.08mm, number of cores: 40, insulator diameter: Ø1mm)						
Accessory		Mounting bracket, coupling						
Weight*3		Approx. 478g (approx. 400g)						

\*1: Not indicated resolutions are customizable.

\*2: Make sure that max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.  
 [Max. response revolution (rpm) =  $\frac{\text{Max. response frequency}}{\text{Resolution}} \times 60 \text{ sec}$ ]

\*3: The weight includes packaging. The weight in parenthesis is for unit only.

※Environment resistance is rated at no freezing or condensation.

SENSORS

CONTROLLERS

MOTION DEVICES

SOFTWARE

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) LIDAR

(D) Door/Area Sensors

(E) Vision Sensors

(F) Proximity Sensors

(G) Pressure Sensors

(H) Rotary Encoders

(I) Connectors/ Connector Cables/ Sensor Distribution Boxes/ Sockets

# ENP Series

## Output Waveform

### 6-division

Model		ENP-111□-006-P						
Shaft revolution angle (°)		0°	60°	120°	180°	240°	300°	360°
Output value		6	1	2	3	4	5	6
Wire color	Wire function							
Black	TP1							
Gray	TP2							
Brown	BCD (2 <sup>0</sup> )							
Red	BCD (2 <sup>1</sup> )							
Orange	BCD (2 <sup>2</sup> )							
White	EP (PARITY)							

※TP1=53°±30', TP2=15°±30' ※P > TS (56°) > TP1 ※P=60°±30'  
 ※Above waveform is based on the positive logic. (the output waveform of negative logic is opposite to above waveform.)

### 8-division

Model		ENP-111□-008-P								
Shaft revolution angle (°)		0°	45°	90°	135°	180°	225°	270°	315°	360°
Output value		8	1	2	3	4	5	6	7	8
Wire color	Wire function									
Black	TP1									
Gray	TP2									
Brown	BCD (2 <sup>0</sup> )									
Red	BCD (2 <sup>1</sup> )									
Orange	BCD (2 <sup>2</sup> )									
White	EP (PARITY)									

※TP1=39°±30', TP2=15°±30' ※P > TS (42°) > TP1 ※P=45°±30'  
 ※Above waveform is based on the positive logic. (the output waveform of negative logic is opposite to above waveform.)

### 12-division

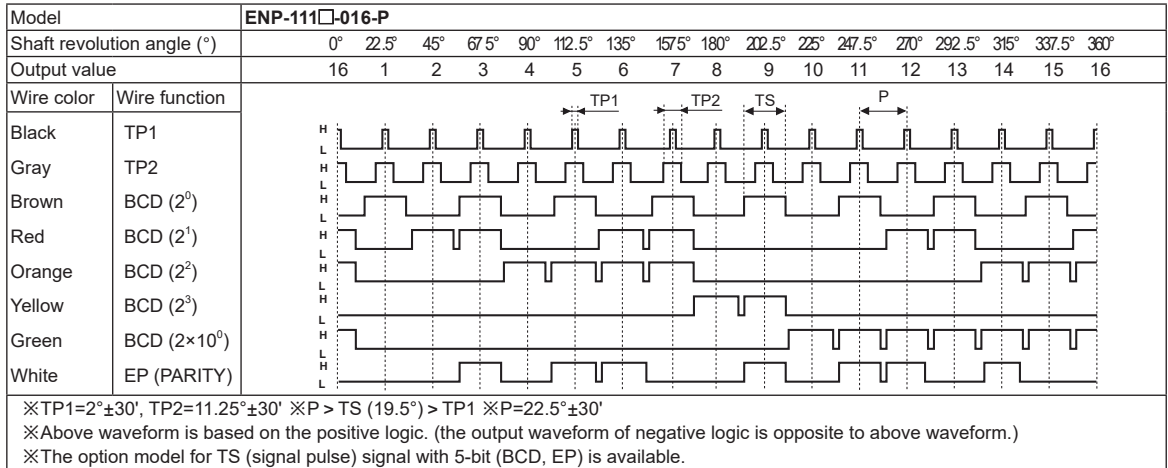
Model		ENP-111□-012-P												
Shaft revolution angle (°)		0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
Output value		12	1	2	3	4	5	6	7	8	9	10	11	12
Wire color	Wire function													
Black	TP1													
Gray	TP2													
Brown	BCD (2 <sup>0</sup> )													
Red	BCD (2 <sup>1</sup> )													
Orange	BCD (2 <sup>2</sup> )													
Yellow	BCD (2 <sup>3</sup> )													
Green	BCD (2×10 <sup>0</sup> )													
White	EP (PARITY)													

※TP1=3°±30', TP2=15°±30' ※P > TS (26°) > TP1 ※P=30°±30'  
 ※Above waveform is based on the positive logic. (the output waveform of negative logic is opposite to above waveform.)  
 ※The option model for TS (signal pulse) signal with 5-bit (BCD, EP) is available.

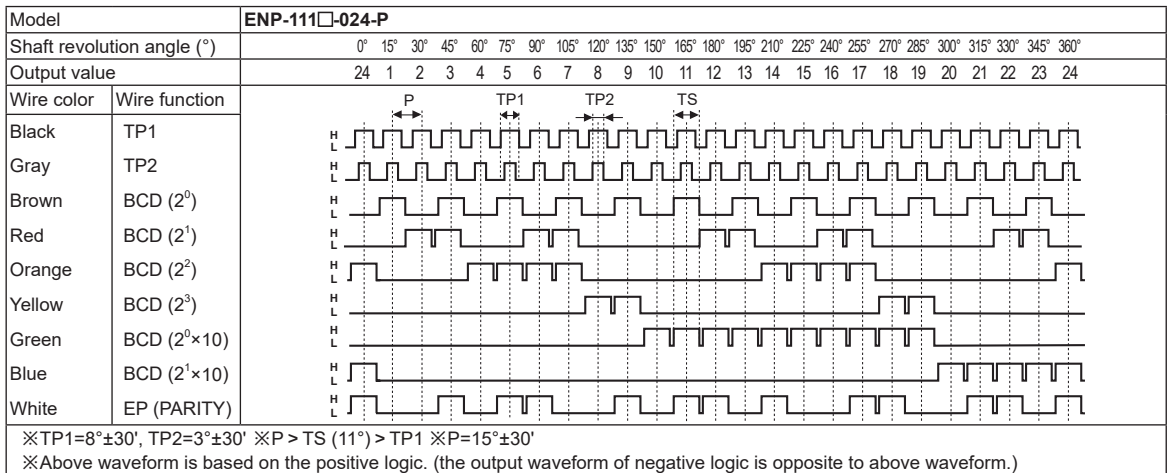
# Absolute Ø60mm Single-turn Shaft Type

## Output Waveform

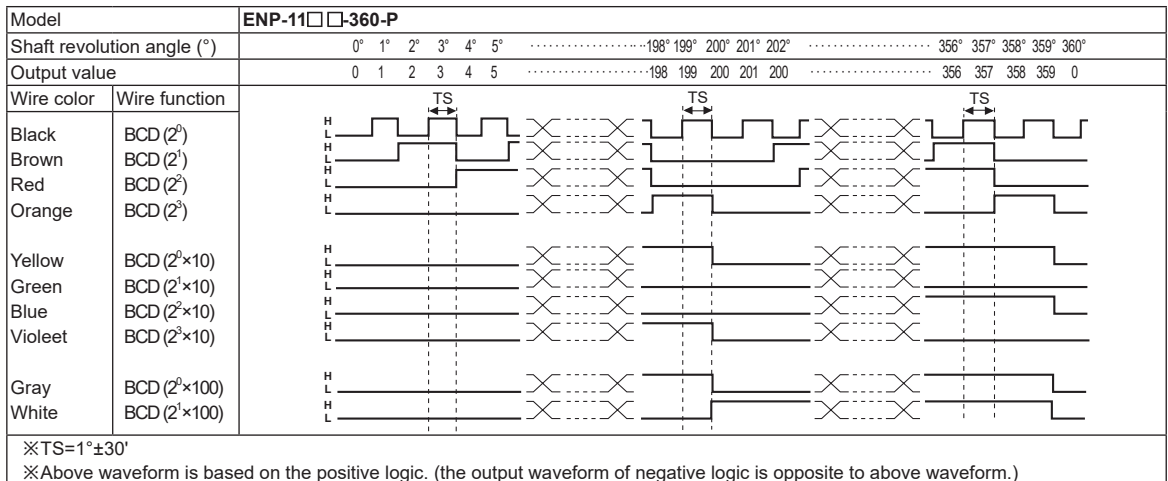
### 16-division



### 24-division



### 360-division



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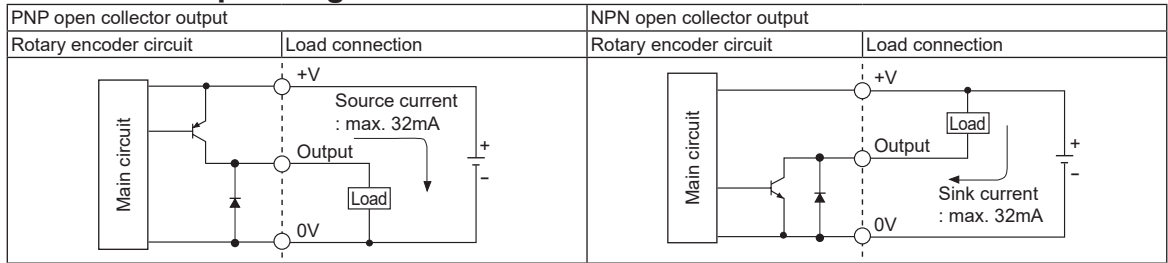
(G) Pressure Sensors

(H) Rotary Encoders

(I) Connectors/ Connector Cables/ Sensor Distribution Boxes/ Sockets

# ENP Series

## Control Output Diagram



※Output circuit of each output signal is same.

## Connections

Resolu ion		6-division	8-division	12-division	16-division	24-division	360-division	
Power wire	White <sup>※1</sup>	+V						
	Black <sup>※1</sup>	GND (0V)						
	Shield	F.G.						
Output wire	Black	TP1 <sup>※2</sup>						
	Brown	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>1</sup>	
	Red	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>2</sup>	
	Orange	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>3</sup>	
	Yellow	N-C	2 <sup>3</sup>	2 <sup>3</sup>	2 <sup>3</sup>	2 <sup>3</sup>	2 <sup>0</sup> ×10	
	Green	N-C	N-C	2 <sup>0</sup> ×10	2 <sup>0</sup> ×10	2 <sup>0</sup> ×10	2 <sup>1</sup> ×10	
	Blue	N-C	N-C	N-C	N C	2 <sup>1</sup> ×10	2 <sup>2</sup> ×10	
	Purple	N-C						2 <sup>3</sup> ×10
	Gray	TP2 <sup>※2</sup>						2 <sup>0</sup> ×100
	White	EP (PARITY) <sup>※3</sup>						2 <sup>1</sup> ×100
Shield	F.G.							

※1: Insulator external diameter is  $\varnothing 1.5\text{mm}$ .

※2: TP1/TP2: Because low resolution model has long output signal period, this signal for enable is easy to determine signal recognition point about output.

※3: EP: Parity signal. It outputs odd parity.

※Unused wire must be insulated.

※Encoder case and shield wire must be grounded.

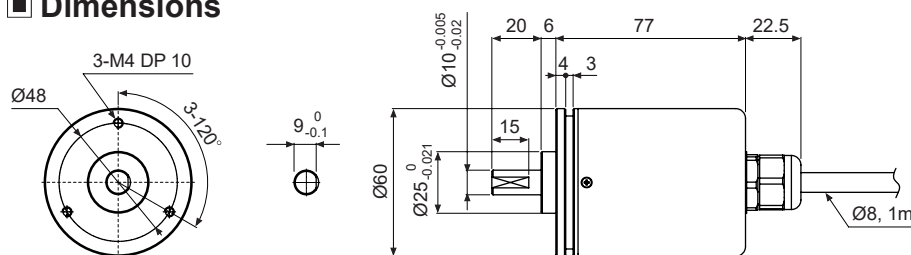
※N-C (not connected)

※Output cable must not be short-circuited, because Driver IC is used in output circuit.

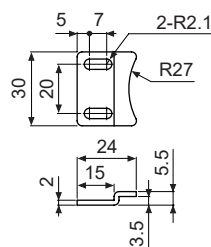
※Do not apply tensile strength over 30N to the cable.

## Dimensions

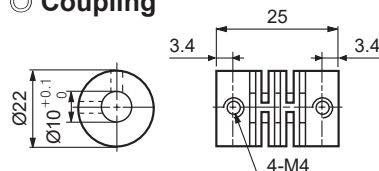
(unit: mm)



### Bracket



### Coupling



- Parallel misalignment: max. 0.25mm
- Angular misalignment: max. 5°
- End-play: max. 0.5mm

※Do not load overweight on the shaft.

※Do not put strong impact when insert a coupling into shaft.

Failure to follow this instruction may result in product damage.

※Fix the unit or a coupling by a wrench under 0.15N·m of torque.

※When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.

※For parallel misalignment, angular misalignment, end-play terms, refer to the "Glossary" section of Technical Description.

※For flexible coupling (ERB series) information, refer to the ERB series section.